International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A63H 33/18

A1

(11) International Publication Number: WO 95/18660

(43) International Publication Date: 13 July 1995 (13.07.95)

(21) International Application Number: PCT/EP94/04299

(22) International Filing Date: 23 December 1994 (23.12.94)

(30) Priority Data:
P 44 00 191.6 5 January 1994 (05.01.94) DE

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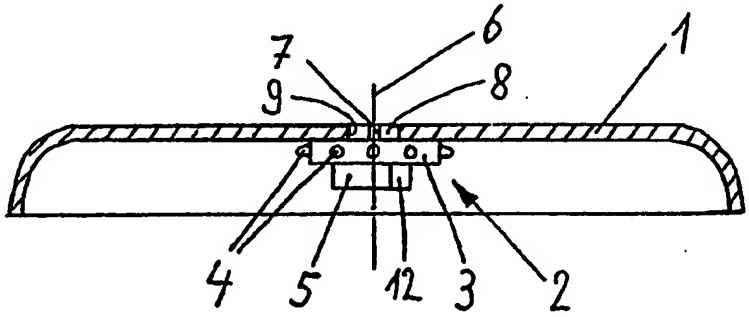
(81) Designated States: AU, BR, CA, CN, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: A DISCUS



(57) Abstract

In a discus having a bowl or dish shape the arrangement is such that the discus (1, 1') is provided with an electrically operated luminous and/or acoustic device (2, 12).

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A discus

The present invention relates to a discus according to the preamble of claim 1.

A discus of this type is known under the name "Frisbee". It is a playing device usually made of plastic material that can be set rotating about its central axis by hand and thereby thrown stably over relatively far distances.

A disadvantage, however, is that the flight of such discuses can often be followed only with difficulty by the eye. This holds in particular at dusk or under poor visibility conditions. Also, the attractiveness of such discuses frequently diminishes for the user after a relatively short playing time.

The invention is therefore based on the problem of providing a discus of the abovementioned type that can be perceived better and has greater attractiveness compared to conventional discuses.

This problem is solved according to the invention by the features of claim 1. Advantageous embodiments of the invention are described in the further claims.

The inventive discus is provided with an electrically operated luminous and/or acoustic device so that corresponding illumination and/or sound effects can be produced. These effects can be extremely diverse depending on the design of the luminous and/or acoustic device. For example it is possible to make individual, in particular different-colored, luminous bodies of the inventive luminous device light up by turns. These luminous bodies can also be disposed on the discus in such a way that they form a certain motif. The luminous bodies can furthermore be driven in such a way as to light up according to a certain time scheme and/or scheme influencing the intensity of luminous power. The luminous bodies can light up continuously or intermittently, for example flashing like a stroboscope. If a suitable acoustic device is provided on the discus a great va-

riety of acoustic effects can be produced either alternatively or in addition to the abovementioned optical effects.

The inventive luminous and/or acoustic device permits the discus to be followed much more easily and better during its flight, whereby the colored play of lights, for example, and possible sound effects considerably increase its attractiveness both for the user and for any onlooker. The hardware components necessary for realizing the inventive luminous and/or acoustic device have such low weight and small dimensions that they do not impair the flying qualities of the discus. It has instead turned out that the slight increase in weight often actually improves the flying qualities.

The luminous and/or acoustic device can be disposed on the underside, top or both sides of the discus. If the luminous and/or acoustic device is disposed on the underside of the discus the bent-down edge of the discus already offers a certain protection for the electric device.

It is also possible for the luminous and/or acoustic device to be disposed in a depression in the discus, in which case the device can be inserted in the depression from the top side of the discus. This provides excellent mechanical protection for the electric device in a simple way.

Alternatively the luminous and/or acoustic device can also be disposed in a raised area on the top side of the discus or on each side, i.e. protruding beyond the top side and underside.

Favorable flying qualities result when the mass center of the luminous and/or acoustic device lies in the center of the discus.

The energy source for the luminous and/or acoustic device can be one-way or rechargeable batteries to be connected to a charging set via a plug socket provided on the luminous and/or acoustic device, or alternative energy sources such as solar cells for example.

Particularly manifold and attractive optical effects can be obtained if the luminous device has a plurality of luminous bodies which are spaced apart. The luminous bodies can realize a great variety of motifs in a simple way.

An easily realized arrangement results if the luminous bodies are disposed in a circle about the central axis of the discus and comprise small incandescent bulbs, light-emitting diodes or flash bulbs.

At least the areas of the discus adjacent the luminous bodies are advantageously made of a transparent material. In this case the luminous effects are visible on both sides of the discus. This is of advantage in particular since the discus frequently flies at a certain inclination to the horizontal, so that both the top side and the underside are visible during flight. It is also possible in this case to embed the electric device completely within the plastic material of the discus, which permits particularly good protection for the electric device.

Alternatively the luminous bodies can be surrounded at least partly by an opaque material provided with diaphragm-like openings for selective exit of light.

The luminous device advantageously has reflecting elements preferably disposed in adjustable fashion for influencing the angle of radiation.

Very interesting optical and/or acoustic effects can be obtained if the luminous or acoustic device has an electric or electronic circuit device for activating the luminous or acoustic means according to a predetermined time scheme and/or scheme influencing the intensity of luminous power or volume and/or tone pitch.

The circuit device advantageously has a time function element activating the luminous means in pulsed fashion, in particular with a pulse duration of 30 to 50%. If luminous means such as LEDs are driven with a pulse width of 30% (or more) the human eye no longer perceives the LEDs lighting up and going out but sees the LED light as steady light. Ad-

vantageously this saves current at the same time since the LEDs are only switched on for example 30% of the total time. This considerably prolongs the working life of normal batteries or that of accumulators between charging times.

If the luminous means include a plurality of luminous bodies, in particular more than four luminous bodies, it is advantageous if the circuit device has a time function element serving as a clock unit and emitting an in particular rectangular current or voltage pulse, said element being connected with a decade counter driving the luminous means.

A particularly great number of possible variations with respect to the drive of the luminous bodies and advantages with respect to weight and overall size result if the circuit device comprises suitably programmed microprocessor control means.

Further interesting luminous and/or sound effects can be obtained if the luminous and/or acoustic means are driven by means of a sensor detecting the direction of rotation, rotational speed, ambient light conditions and/or flying speed of the discus.

The invention will be explained in more detail in the following by way of example with reference to the drawing, in which:

Figs. 1-6 show partly cross-sectional, schematic side views of six different embodiments of the inventive discus,

Figs. 7A-7C show schematic representations of various possibilities of disposing luminous bodies on a carrier,

Fig. 8 shows a circuit diagram of the electric circuit device for an LED luminous body,

Fig. 9 shows a circuit diagram of a further embodiment of an electric circuit device for driving eight LED luminous bodies,

Fig. 10 shows a circuit diagram of a further embodiment of the electric circuit device for driving sixteen LED luminous bodies.

Fig. 1 shows discus 1 known as a "Frisbee" having a bowl or dish shape. Luminous device 2 is fastened to the underside of discus 1 and has carrier 3 for luminous bodies 4 and electric circuit device 5 with a simple rectangular pulse time function element, a decade counter or a suitably programmed microprocessor.

Luminous device 2 is disposed axially to central axis 6 of discus 1 so that the mass center of luminous device 2 lies in central axis 6 or at least as close as possible thereto. Luminous device 2 can be fastened to discus 1 by glue.

Luminous bodies 4 protrude radially outward from carrier 3 and are spaced apart in a circle about central axis 6. Luminous bodies 4 can comprise permanently wired light-emitting diodes, flash bulbs or small incandescent bulbs received in corresponding sockets in carrier 3.

Luminous bodies 4 are supplied with energy by one or more rechargeable, small-sized batteries (not shown) of luminous device 2. For recharging these batteries plug socket 7 is provided on the top side of luminous device 2 into which a corresponding plug of a charging set (not shown) can be inserted. Plug socket 7 can be received within projection 8 of luminous device 2 that extends upward through circular gap 9 within discus 1.

Electric circuit device 5 drives luminous bodies 4 in such a way that they light up according to the predetermined time scheme and/or scheme influencing the intensity of luminous power.

A switch (not shown) is also provided on luminous device 2 for switching the luminous device on and off.

Discus 1 can be made of a plastic material which is transparent at least in the area of luminous bodies 4 so that the lighting up of luminous bodies 4 can be perceived not only from the underside of discus 1 but also through discus 1 from its top side. It is also possible to metalize

the underside of discus 1 to increase the luminous effect of luminous bodies 4 downward.

In the alternative embodiment apparent from Fig. 2 discus 1 has rotationally symmetric, central depression 9 which is open toward the top. Luminous device 2 is inserted into depression 9 from above. The opening of depression 9 is closed by cover plate 10 whose top side is flush with the top side of the bordering areas of discus 1. Plug socket 7 can extend through cover plate 10, as shown, so that the latter need not be removed for charging the batteries. To prevent dirt or moisture from entering plug socket 7 the latter can be closed by suitable stopper 11.

In the embodiment shown in Fig. 2 the electric circuit device is received within carrier 3. In this embodiment at least the area of depression 9 and/or cover plate 10 are also made of a transparent material so that the lighting up of luminous bodies 4 is visible through the material.

In the alternative embodiment shown in Fig. 3 luminous bodies 4 are disposed on the top side of discus 1 while electric circuit device 5 is located on its underside. Luminous bodies 4 and carrier 3 are covered by transparent cap 13 so that luminous bodies 4 shine through to the outside, on the one hand, and are protected, on the other hand.

Cap 14 drawn over electric circuit device 5 ensures protection of the electric or electronic components.

Fig. 4 shows discus 1 wherein luminous bodies 4 are disposed both on the top side and on the underside of discus 1. Electric circuit device 5 is likewise located on the underside of discus 1.

Fig. 5 shows a further embodiment of discus 1 wherein reflecting elements 15 are disposed within bottom cap 14 to influence in a desired way the angle of emission of the light radiated by luminous bodies 4.

To permit variation of the angle of emission, reflecting elements 15 are expediently disposed in adjustable fashion.

Fig. 6 shows a further embodiment of discus 1 wherein upper cap 13 and lower cap 14 are shown, not in cross section as in Figs. 3 to 5, but in a side view. In this embodiment cap 14 is made of an opaque material. However, to permit a selective exit of light from luminous bodies 4 disposed within cap 14 and shown by broken lines, cap 14 has slotlike light exit openings 16 that have the effect of a diaphragm and limit the angle of emission. Instead of slotlike light exit openings one can also provide ones with other cross-sectional shapes, for example circular light exit openings.

Figs. 7A to 7C show various possibilities for disposing luminous bodies 4 on carrier 3.

In the embodiment shown in Fig. 7A luminous bodies 4 are disposed with their feet parallel to carrier 3, for example a printed board, and fastened thereto.

In the embodiment shown in Fig. 7B luminous bodies 4 are disposed perpendicular to carrier 3, the feet of luminous body 4 piercing carrier 3 and being fastened thereto.

In the embodiment shown in Fig. 7C luminous bodies 4 are disposed at certain angle α to carrier 3. In the embodiment example shown, angle α is 45° but it can also be different depending on the desired angle of radiation of luminous bodies 4.

To ensure simple assembly and firm holding of luminous bodies 4 at the given angle, carrier 3 has holding plate 17 which is beveled at angle α and serves as a support for the feet of luminous bodies 4.

Discuses 1 shown in Figs. 1 to 6 can be provided with acoustic device 12 (shown for clarity's sake only in Fig. 1) having one or more acoustic elements, for example small loudspeakers, which are driven in the desired way by electric circuit device 5. It is also possible to provide only a suitable acoustic device instead of a luminous device.

With reference to Figs. 8 to 10 three alternative embodiment examples for electric circuit device 5 will be explained in more detail in the following.

In Figs. 8 to 10 the abbreviations have the following meanings:

GND: Ground
VCC: Supply voltage

Fig. 8 shows a circuit diagram of an electric circuit device suitable in particular for electrically driving a small number, in particular 1 to 4, light-emitting diodes and producible in cost-effective fashion.

As apparent from Fig. 8, light-emitting diode D1 is driven via output Q of time function element IC 1 in the form of an integrated circuit. Time function element IC 1 is supplied via input R with energy that is supplied by battery BT 1 with a voltage of 3.6 volts. Time function element IC 1 emits rectangular current pulses with a pulse width of 30% to light-emitting diode D1. This causes the LED light emitted by light-emitting diode D1 to be perceived by the human eye as identical with 100% drive, i.e. steady light, while about 70% current can simultaneously be saved.

Time function element IC 1 is a usual commercial component that need not be described in any detail.

Light-emitting diode D1 is connected with supply voltage VCC in the customary way via resistor R4 on the anode side and via transistor T1 and resistor R3 on the cathode side.

By means of time function element IC 1 and the manner of driving the light-emitting diode (1000 mcd at 100 mA) one can obtain a maximum luminous intensity at minimal current (a mean of about 30 mA).

Via socket 19 the electric circuit device can be connected to a charging set. When the plug (not shown) of the

charging set is inserted in socket 19, battery BT 1 is disconnected from ground and charged.

The electric circuit device shown in Fig. 9 is suitable in particular for driving more than four luminous bodies.

These luminous bodies comprise eight light-emitting diodes D1A to D4A and D1B to D4B connected to decade counter IC 3 via transistors T2 to T9 and resistors R6 to R13.

Decade counter IC 3 is connected in terms of input with time function element IC 2 which, in the same way as time function element IC 1, delivers current to decade counter IC 3 only in pulsed fashion, preferably in the form of a rectangular pulse. The pulse width here is 40%. However time function element IC 2 is used additionally as a clock unit for decade counter IC 3.

Input R of time function element IC 2 is connected with switch SW 1. Switch SW 1 is used to influence the order in which the light-emitting diodes are driven by decade counter IC 3 and accordingly light up.

The frequency of lighting up can be influenced by means of potentiometer P1 connected between the output of switch SW 1 and input DIS of time function element IC 2.

Time function element IC 2 can also be driven by further counter IC 4 that limits the time of LED light rotation.

Switch SW 2 connected with terminals Q 10 to Q 12 influences by its position the duration of light rotation. When the activated switch is reached in counter IC 4 the latter stops time function element IC 2.

Touch contact SW 3 connected with input RST of counter IC 4 serves to re-enable time function element IC 2.

Fig. 10 shows an electric circuit device wherein the switching functions are realized by means of microprocessor IC 5. The clock frequency of microprocessor IC 5 is given by reference counter 18, for example a quartz crystal. The supply voltage is 4.8 volts and is delivered by battery BT 1 which can likewise be charged via socket 19.

Microprocessor IC 5 is used to drive altogether sixteen different light-emitting diodes D2 to D17 via lines L1 to L16, resistors R3 to R18 and transistors T1 to T16. Lines L1 to L16 are shown in Fig. 10 partly in the form of bus 18.

The microprocessor requires software involving about 4 KB. Ports P 0.0 to P 0.7 and P 2.0 to P 2.7 serve to drive the light-emitting diodes. Port P 1.0 to P 1.7 is utilized as a control and start strip. Pin 1 starts the program selected in pins 3 to 7 which lasts about 2 minutes. Before this time has lapsed the program can be canceled by the key button on pin 1. The direction of the light-emitting diodes is controlled via pin 3 and their speed via pin 4. Eight basic programs can be called via pins 5 to 7.

Claims

1. A discus having a bowl or dish shape, characterized in that the discus (1) is provided with an electrically operated luminous and/or acoustic device (2, 12).

2. The discus of claim 1, characterized in that the device (2, 12) is disposed on the lower and/or top side of the discus (1).

3. The discus of claim 2, characterized in that the device (2, 12) is disposed in a depression (9) in the discus (1).

4. The discus of claim 2, characterized in that the device (2, 12) is disposed in a raised area on the top side of the discus (1).

5. The discus of claim 1, characterized in that the mass center of the device (2, 12) lies in the center of the discus (1).

6. The discus of claim 1, characterized in that the device (2, 12) is supplied with electricity by rechargeable batteries.

7. The discus of claim 6, characterized in that the batteries are adapted to be connected to a charging set via a plug socket (7) provided on the device (2, 12).

8. The discus after claim 1, characterized in that the device (2, 12) is adapted to be operated by solar energy.

9. The discus of claim 1, characterized in that the luminous device (2) has luminous means in the form of at least one luminous body (4).

10. The discus of claim 9, characterized in that the luminous device (2) has a plurality of luminous bodies (4) which are spaced apart.

11. The discus of claim 10, characterized in that the luminous means are disposed in a circle about the central axis (6) of the discus (1).

12. The discus of claim 9, characterized in that the luminous means comprise small incandescent bulbs and/or light-emitting diodes and/or flash bulbs.

13. The discus of claim 10, characterized in that at least the areas of the discus (1) adjacent the luminous bodies (4) are made of a transparent material.

14. The discus of claim 10, characterized in that the luminous bodies (4) are surrounded at least partly by an opaque material provided with diaphragm-like openings for selective exit of light.

15. The discus of claim 1, characterized in that the luminous device (2) has reflecting elements (15) disposed in adjustable fashion for influencing the angle of radiation.

16. The discus of claim 9, characterized in that the luminous device (2) has an electric or electronic circuit device for activating the luminous means according to a predetermined time scheme and/or scheme influencing the intensity of luminous power.

17. The discus of claim 1, characterized in that the sound generation device (12) has acoustic means comprising at least one acoustic element connected with an electric or electronic circuit device for activating the acoustic means according to a predetermined time scheme and/or scheme influencing the volume and/or tone pitch.

18. The discus of any of claims 9 to 17, characterized in that various luminous bodies (4) and/or acoustic elements or various groups of luminous bodies (4) and/or acoustic elements are adapted to be activated alternatingly by means of the circuit device.

19. The discus of any of claims 16 to 18, characterized in that the circuit device has a time function element (IC 1, IC 2) activating the luminous means in pulsed fashion, in particular with a pulse duration of 30 to 50%.

20. The discus of any of claims 16 to 18, characterized in that the circuit device has a time function element (IC 2) serving as a clock unit and emitting an in particular

rectangular current or voltage pulse, said element being connected with a decade counter (IC 3) driving the luminous means.

21. The discus of any of claims 16 to 18, characterized in that the circuit device has microprocessor control means.

22. The discus of any of claims 9 to 21, characterized in that the luminous and/or acoustic means are driven by means of a sensor detecting the direction of rotation and/or rotational speed and/or ambient light conditions and/or flying speed of the discus (1).

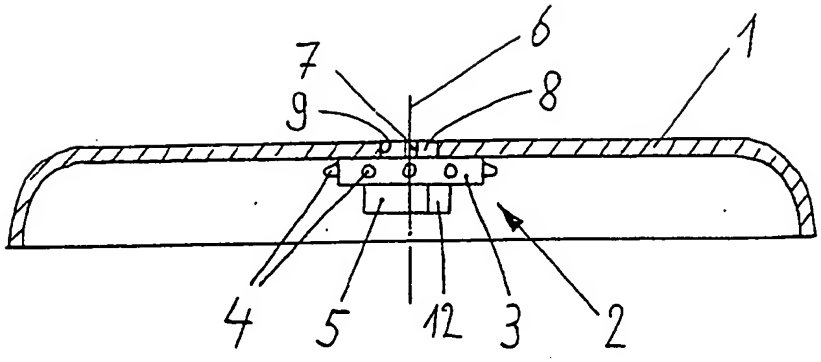

Fig. 1

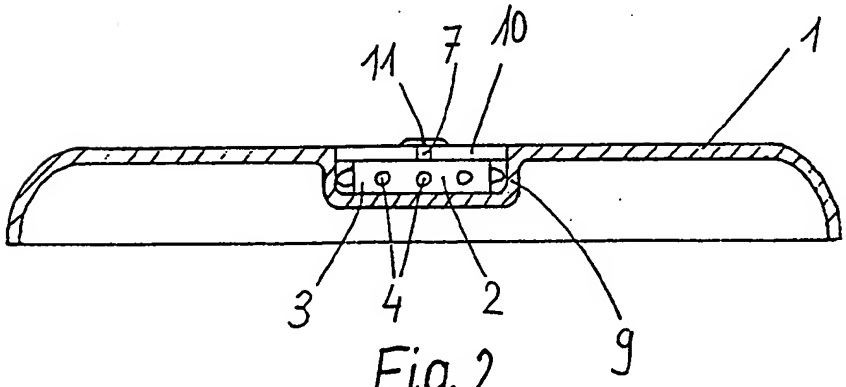

Fig. 2

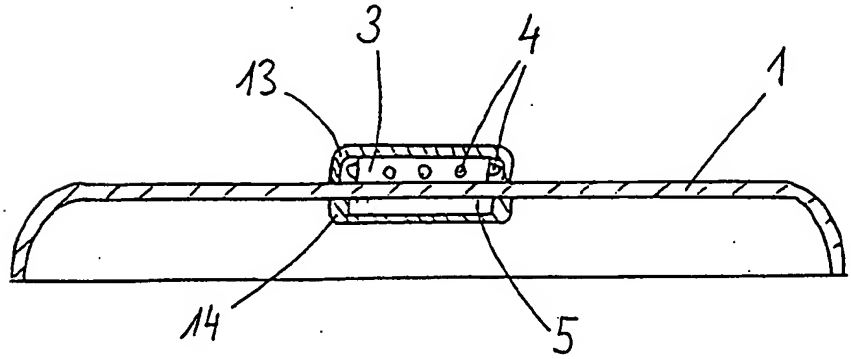

Fig. 3

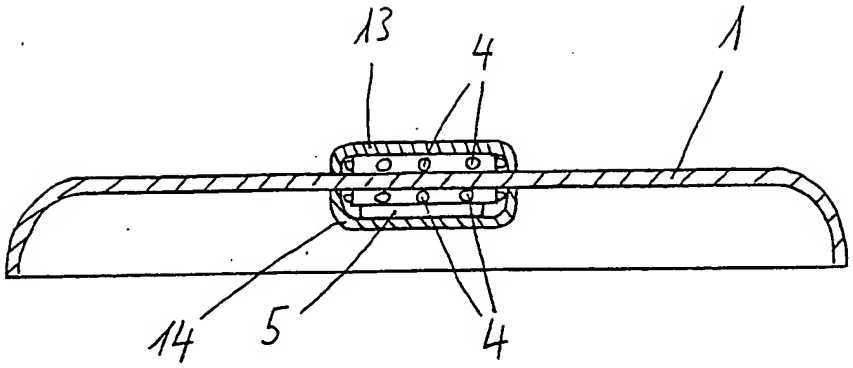

Fig. 4

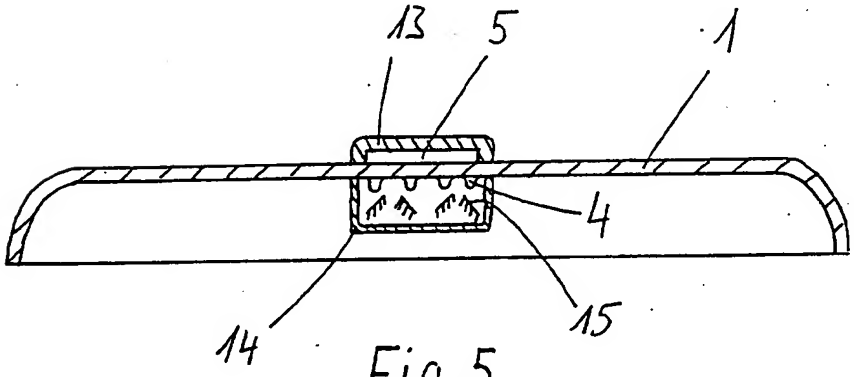

Fig. 5

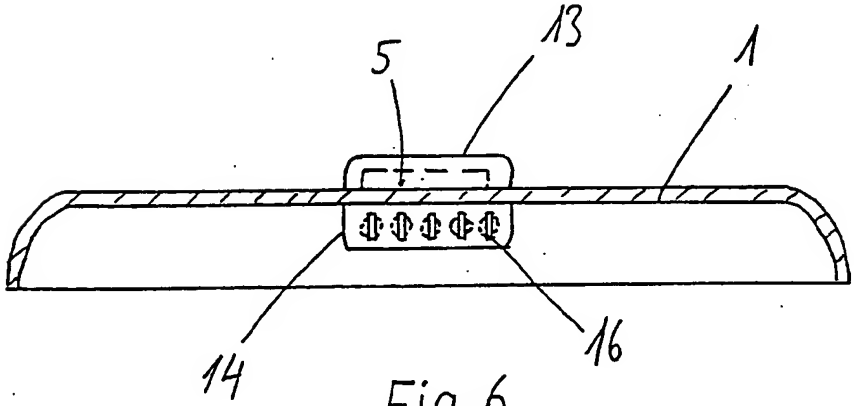

Fig. 6

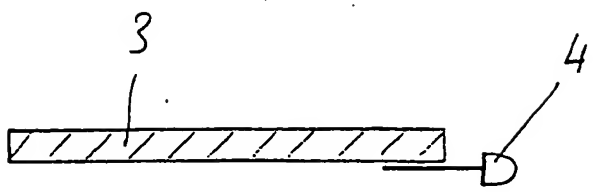

Fig. 7A

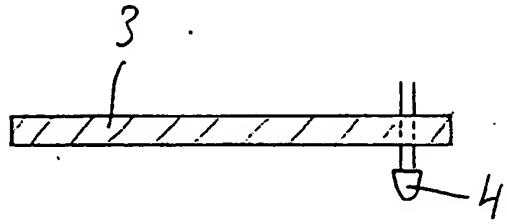

Fig. 7B

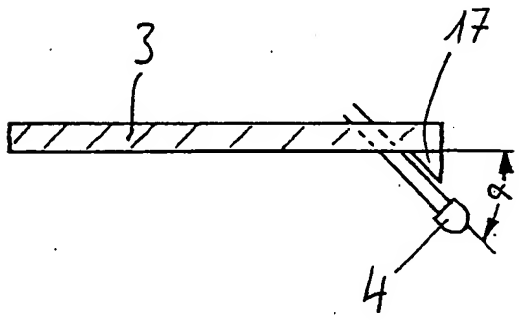

Fig. 7C

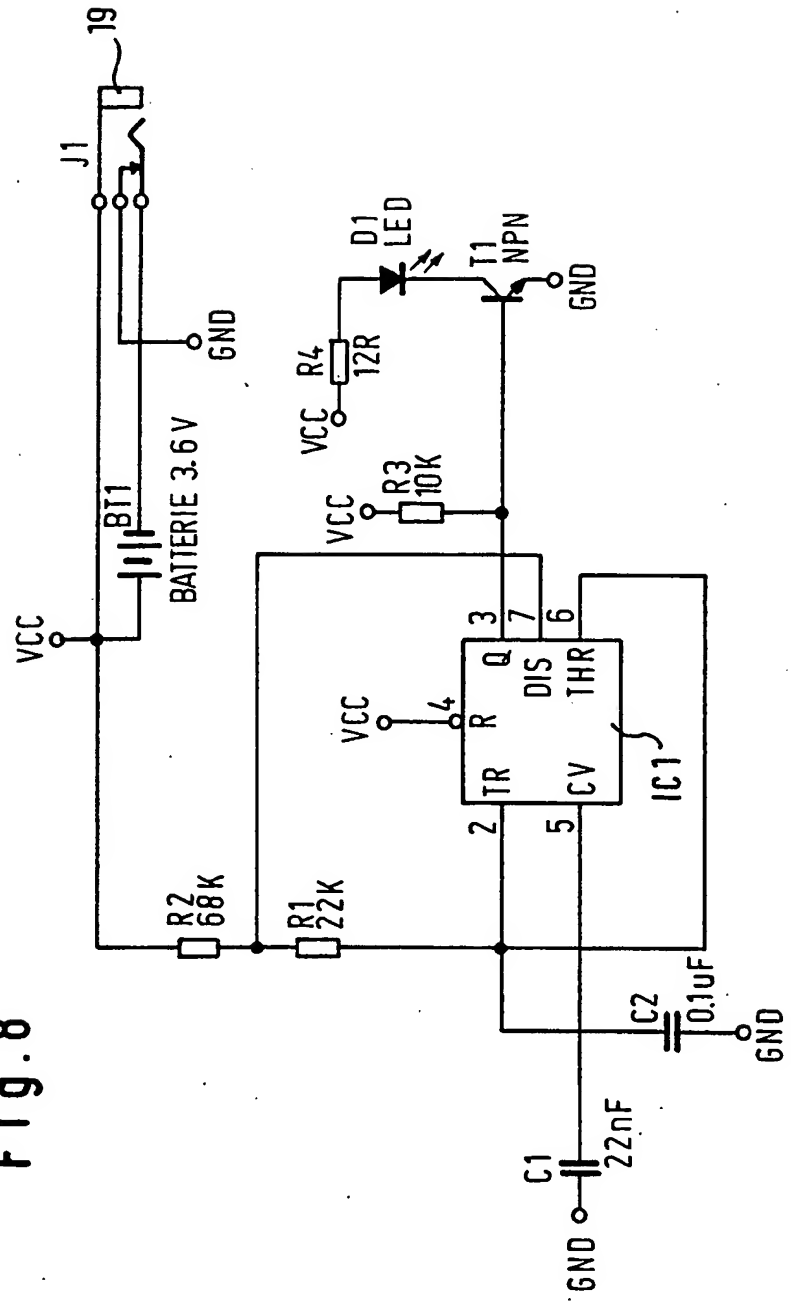
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Fig.8

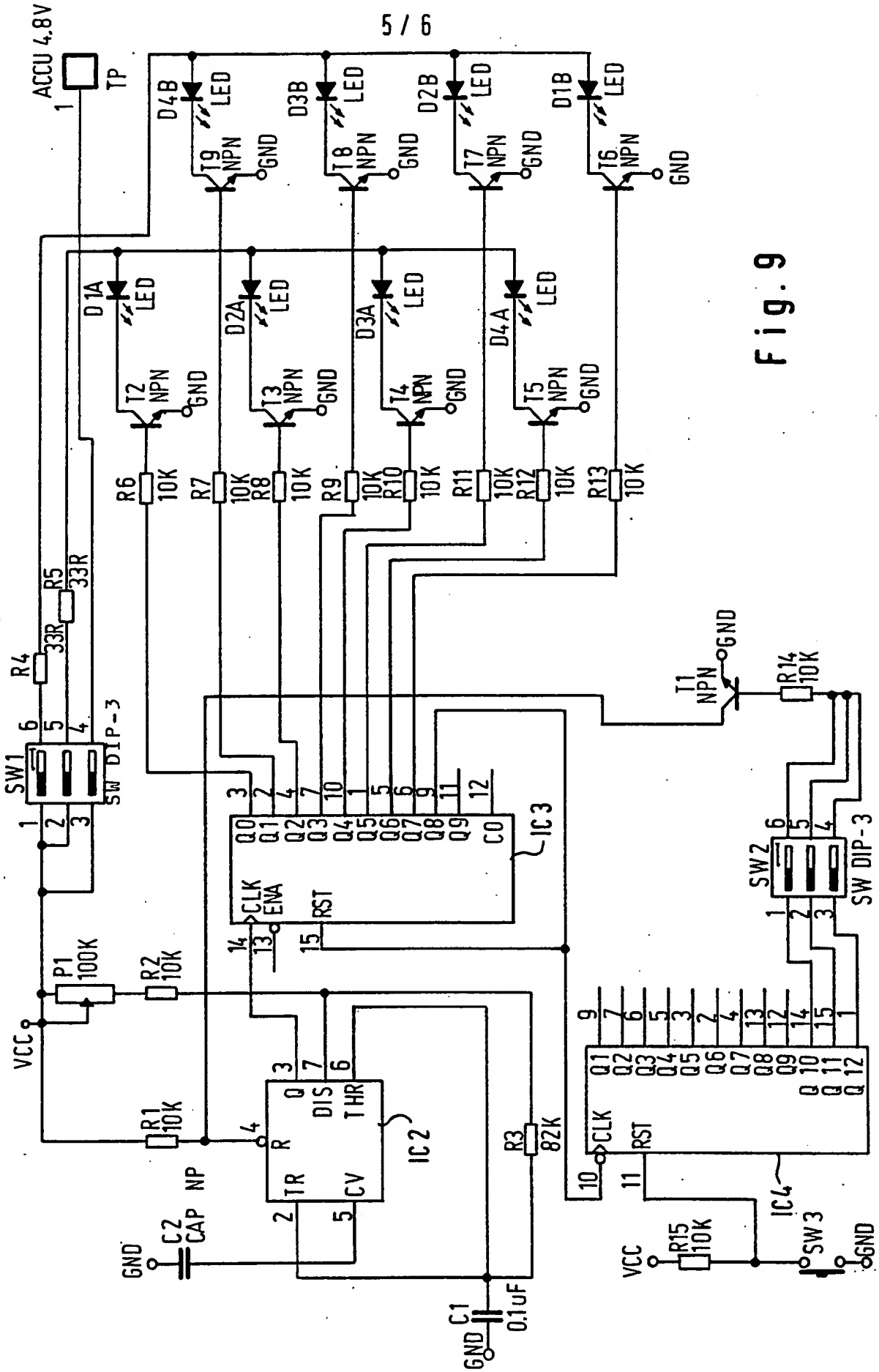
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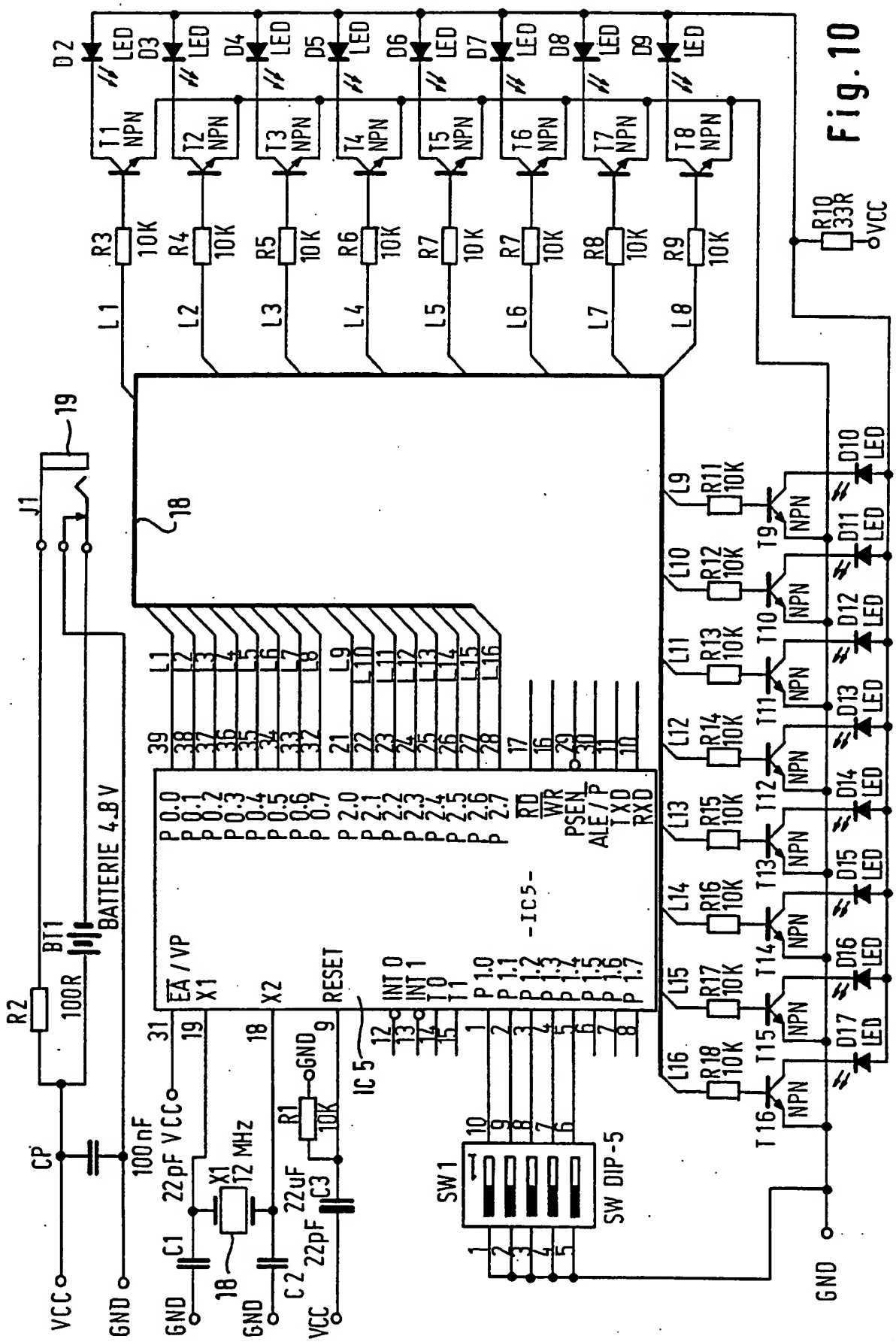
Fig. 9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19
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SW DIP-5
L9 R11 10K T9 NPN D10 LED
L10 R12 10K T10 NPN D11 LED
L11 R13 10K T11 NPN D12 LED
L12 R14 10K T12 NPN D13 LED
L13 R15 10K T13 NPN D14 LED
L14 R16 10K T14 NPN D15 LED
L15 R17 10K T15 NPN D16 LED
L16 R18 10K T16 NPN D17 LED

Fig. 10

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A63H33/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A63H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,A,34 25 037 (HGS-GEBR. SCHREIB GMBH) 6 February 1986	1,2,5,6, 9-12, 16-18,22
Y	see claims 5,17; figure 2 see page 7, line 32 - page 8, line 15	8,20
X	US,A,4 929 212 (SHING-LAM LI) 29 May 1990 see column 4, line 15 - line 23; figure 2	1-3,19
X	US,A,4 307 538 (MOFFIT) 29 December 1981 see figure 3	1,2,4
X	US,A,3 720 018 (PETERSON ET AL.) 13 March 1973 see column 4, line 1 - line 8; figures 1,4,6	1,9,10, 13

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 April 1995	28.04.95
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Papa, E

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,3 786 246 (JOHNSON ET AL.) 15 January 1974 see column 4, line 25	1,9,10, 13
X Y	US,A,3 812 614 (HARRINGTON) 28 May 1974 see column 2, line 20 - line 32	1,9,16 20
Y	US,A,5 145 442 (ZAN ET AL.) 8 September 1992 see column 1, line 58 - line 59	8

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A-3425037	06-02-86	NONE	
US-A-4929212	29-05-90	NONE	
US-A-4307538	29-12-81	NONE	
US-A-3720018	13-03-73	NONE	
US-A-3786246	15-01-74	NONE	
US-A-3812614	28-05-74	NONE	
US-A-5145442	08-09-92	NONE	